A Danish register-based study on involuntary treatment in anorexia nervosa

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Abstract

Objective: Involuntary treatment is controversial and widely debated, but remains a significant component of treatment for severe anorexia nervosa. Given how little is known about this topic, we describe the frequency of various involuntary measures in a national cohort of all patients diagnosed with anorexia nervosa. In a subsample of patients, we explored predictors of the first involuntary measure recorded.

Method: Descriptive statistics and Cox proportional hazard analyses were conducted using the national registers of Denmark covering the total population. Data from the National Patient Register and the Psychiatric Central Research Register including all psychiatric visits from 1969 onwards were merged with data from the National Register on Coercion covering 1999 onward. Involuntary measures registered between 2000 and 2013 were analyzed.

Results: A total of 4,727 patients with a diagnosis of anorexia nervosa representing 16,592 admissions were included. Eighteen percent experienced at least one involuntary measure. A variety of measures were used with tube feeding being the most frequent followed by mechanical restraint, involuntary medication, physical restraint, constant observation, and sedative medication. A subsample of 2% of AN patients had more than 100 involuntary measures recorded. The first recorded involuntary measure was predicted by most but not all psychiatric comorbidities, especially schizophrenia, autism spectrum, and personality disorders, older age at first diagnosis, and previous admissions.

Discussion: It is important to develop a more granular understanding of patients at risk of requiring involuntary treatment and to determine how best to treat them effectively with minimal use of involuntary measures.

KEYWORDS

anorexia nervosa, coercion, comorbidity, eating disorders, involuntary treatment, severe and enduring anorexia nervosa

1 | INTRODUCTION

The use of involuntary treatment and specific involuntary treatment measures in patients with severe psychiatric illness is both controversial and widely debated as it raises basic ethical questions about the rights and the needs of the individual (Campbell & Aulisio, 2012; Kallert, 2008; Westmoreland, Johnson, Stafford, Martinez, & Mehler, 2017). Although involuntary treatment may be unavoidable and life-saving; it may also violate the fundamental rights of the individual. In many countries, including Denmark, awareness of involuntary treatment has increased in the public and the political system resulting in efforts to minimize its use. To inform this process, research addressing the frequency of specific involuntary measures and the conditions under which they are used is of considerable value.

Anorexia nervosa is a severe psychiatric illness often beginning in the early or mid-teens and lasting from few months to many years (Von Holle et al., 2008). In severe cases, the illness is lifelong resulting in lower education, lower general function and quality of life, increased self-harm, suicide attempts, and elevated mortality (Keshaviah et al., 2014; Koutek, Kocourkova, & Dudova, 2016; Latner, Vallance, & Buckett, 2008; Maxwell et al., 2011). Except for drug misuse, anorexia nervosa has the highest mortality rate of all psychiatric disorders (Chesney, Goodwin, & Fazel, 2014). Causes of death include suicide, somatic complications of low weight, and natural causes (Papadopoulos, Ekbom, Brandt, & Ekselius, 2009). Involuntary treatment including involuntary admissions and detention, for re-nutrition or prevention of self-harm, or suicide, has been reported in 13–44% of inpatient admissions for eating disorders across developed countries (Clausen & Jones, 2014).

Information on types, duration, and factors associated with the use of various involuntary measures in anorexia nervosa is scant. Two systematic reviews exist including eight overlapping studies (Clausen & Jones, 2014; Elzakkers, Danner, Hoek, Schmidt, & Van Elburg, 2014). The source studies were all naturalistic case studies covering between 11 and 397 patients with 8–81 patients treated involuntarily. The frequency of involuntary tube feeding and treatment on locked wards was mentioned in one study (46 and 42%, respectively) (Carney, Wakefield, Tait, & Touyz, 2006). Other details on the frequency of use of various involuntary measures are non-existent. In terms of predictors, patients who were treated involuntarily had more previous admissions, greater comorbidity and self-harm, and longer duration of illness (Clausen & Jones, 2014).

In Denmark as in other countries, there is an increasing focus on reducing involuntary treatment. To inform and optimize this process, knowledge on types, amount, and predictors of involuntary treatment is relevant. The existence of complete national register data affords the detailed exploration of the use of specific involuntary measures. Thus, we describe the frequency of various types of involuntary measures used in patients diagnosed with anorexia nervosa as reported in the Danish registers, and analyze predictors of the first recorded involuntary measure. We hypothesized that psychiatric comorbidity, older age at diagnosis (described to have poor prognosis by Steinhausen, 2002), previous admissions, history of parental psychiatric illnesses, and parental educational level (reflecting parental resources) would predict involuntary treatment. We also explored whether gender, ethnicity, calendar year, and mother's age at birth of child were associated with involuntary treatment measures. As comorbidity is common among patients with anorexia nervosa, especially among the most severe and enduring cases (Clausen & Jones, 2014; Spindler & Milos, 2007), it is difficult to determine, with the exception of tube feeding, whether to attribute involuntary treatment to a specific psychiatric presentation (e.g., it cannot be determined whether restraint is used in response to the eating disorder only or comorbid depressive symptoms). We acknowledge that involuntary measures may be applied for multiple complex reasons. Thus, for all patients ever diagnosed with anorexia nervosa, we explored all psychiatric admissions and involuntary measures after receiving a diagnosis of AN. This includes patients with an index admission who carry a current registered eating disorder diagnosis (anorexia nervosa or other eating disorder), and admissions of patients with documented histories of anorexia nervosa, even if an eating disorder diagnosis was not registered as a diagnosis for the index admission.

2 | METHOD

2.1 | Study setting and measures

A cohort of all patients diagnosed with anorexia nervosa and treated as outpatients or inpatients in Denmark was identified through the longitudinal Danish population registers. A cohort approach can answer important clinical questions by exploring associations that are difficult to detect in small clinical samples (Mors, Perto, & Mortensen, 2011; Munk-Jorgensen & Ostergaard, 2011). All Danish residents have a unique personal identification number (CPR number) enabling merging of data across population registers. In the present study, we used the National Patient Register (NPR) (Munk-Jorgensen & Ostergaard, 2011) and the Psychiatric Central Research Register (PCR) (Munk-Jorgensen & Mortensen, 1997) to identify all individuals diagnosed with anorexia nervosa between 1969 and 2013. The National Register on Coercion (TIP) includes information on all coercive episodes (i.e., involuntary treatment measures) delivered on psychiatric wards in Denmark, that is, the CPR number, hospital code, each involuntary measure and the start and end date/time. All records of involuntary measures except ECT, gloves (to prevent the person from scratching herself or others, usually used with straps) and measures aimed at treating somatic illness were included (see paragraph describing involuntary measures). Diagnosis is not included in TIP, but was identified in the PCR or the NPR, matched via personal identification number and the dates of treatment. The TIP was started in 1999. To avoid any uneven coverage associated with the ramp-up period, we selected 2000 as the starting point for the present study. As data on involuntary measures before 2000 were not available, the predictor analysis only included a subsample of the total population, that is, patients who could not have had involuntary treatment for anorexia nervosa before 2000. Information on prior admissions and parental psychopathology were calculated through dates from the NPR and PCR. Highest level of parents' education was identified in the Population's Education Register held by Statistics Denmark (Jensen & Rasmussen, 2011).

The study was approved by the Danish Patient Safety Authority and the Danish Data Protection Agency and was conducted in accordance with the Helsinki Declaration. All information came from and was stored in the registers and was anonymized to the researchers, so written informed consent was not required according to Danish law.

2.2 | Involuntary treatment in Denmark

According to the Danish Mental Health Act (Danish Ministry of Health, 2015) all types of involuntary measures can only be administered within state hospitals, if the patient is psychotic or in a similar state of mind, if the chance of recovery or improvement of the mental condition will deteriorate without treatment, or if the person or others are at risk. Every measure and every episode of using that measure

must be reported separately, with the exception of brief physical restraint required to implement other measures, on a person level (using the CPR numbers) to TIP under the Danish Health Authority and be included in the national register according to the current Mental Health Act.

As practice of involuntary measures can differ across countries, we provide a detailed explanation here. Involuntary measures can be used in open or permanently locked wards. Detention refers to situations in which the desired discharge of a voluntarily admitted patient is denied. In these cases, also locked doors can be used if a patient in an open ward is obvious at risk of elopement. Guard/observations are used when a patient needs to be continuously observed to prevent self-harm (including severe purging behavior). Both of these are registered separately. Physical restraint is when personnel physically restrain a patient and mechanical restraint is when an individual is secured with straps or a belt. Involuntary sedative medication is used to calm a patient—often in an acute situation and involuntary medication refers to when a patient resists planned and necessary treatment with psychotropic medication. All types of administrations that are applied to administer psychotropic medication against patients' will are included. Involuntary tube feeding is registered when the department is granted permission to use a nasogastric tube to feed a patient who refuses to eat. An involuntary tube feeding episode reflects the permission to tube feed, not the number of meals or episodes of tube insertions. A permission persists until the chief physician discontinues it or until the admission ends unless the patient lodges a complaint and decision is made in favor of the patient. To ensure stable treatment course and progression it is common to maintain the permission to tube feed or medicate involuntarily for a longer time than actually administered. Involuntary measures with ECT, and gloves (to prevent the person from scratching herself or others, usually used with straps) were not included in this study as they are not used for eating disorder symptoms in Denmark.

2.3 | The samples

The study includes two samples. The first sample comprises all individuals in Denmark diagnosed with anorexia nervosa [ICD-10: F50·0 and F50·1, ICD-8: 306·50, 306·58, 306·59] in a hospital after age 6, registered in the PCR between 1969 and 2013 or the NPR between 1977 and 2013, and who had an inpatient admission according to PCR at the time of the AN diagnosis or later, at age 10 or older between 2000 and 2013. The second sample used to predict the first registered involuntary measure comprises individuals born in 1985 or later diagnosed with anorexia nervosa in the PCR or the NPR after age 6 and after 1 January 2000 and before the end of 2013, that is, including periods of out-, inpatient, and no treatment. These individuals were followed from the date of anorexia nervosa diagnosis or their 10th birthday, whichever came last, and until first report of an involuntary measure after age 10, date of death or emigration from Denmark, or 31 December, 2013, whichever came first.

All admissions to psychiatric and somatic wards for the included sample were used along with registration of every involuntary treatment episode, and a coding of the current registered diagnoses at each admission. We exclude acute wards as these are either transitory or precede admission to the wards. If no eating disorder diagnosis was registered in relation to an admission with an involuntary measure, the episode was grouped as unrelated to an eating disorder.

2.4 | Statistics

Descriptive statistics of all types of involuntary measures were counted and reported according to whether the episode occurred during an admission in which a current eating disorder was registered or not. Distributions across calendar years and age at admission were also reported. To predict clear eating disorder-related first episode of involuntary treatment, and to examine the most severe cases, analyses were conducted twice. First, we included the first involuntary measure in patients with a lifetime anorexia nervosa diagnosis regardless of whether there was a registered eating disorder diagnosis at the index admission (e.g., a person with anorexia nervosa who was admitted with a current diagnosis of major depression). Second, we included the first involuntary measure that occurred during admissions when a current eating disorder was officially registered. In the second analysis, a person was censored if the first involuntary measure occurred during an admission when no eating disorder was registered, but another psychiatric illness was registered. In the predictor analysis, only comorbid psychiatric illnesses that were registered prior to first admission that included an involuntary measure were included.

Hazard ratios with 95% confidence intervals for first registered involuntary measure were calculated using Cox proportional hazard regression with age as the underlying time axis. Psychiatric comorbidity (diagnosed before index admission), any parental psychiatric illness, earlier admissions (after a diagnosis of anorexia nervosa but before index admission), and calendar time (grouped 2000–2004, 2005–2009, 2010–2013) were treated as time-dependent covariates during follow-up. Sex, age at first anorexia nervosa diagnosis, and maternal and paternal educational level were included as time-independent covariates.

3 | RESULTS

The sample included 4,727 patients diagnosed with anorexia nervosa in the Danish registers in the period between 1969 and 2013 and admitted to inpatient treatment between 2000 and 2013. In total, these individuals had 16,592 inpatient admissions with 49.5% including an eating disorder diagnosis. Main diagnoses for the admissions that did not include a registration of an eating disorder were schizophrenia (F20–F29) (24.7% of admissions), personality disorders (F60–F69) (15.0% of admissions), mental and behavioral disorders due to alcohol or drug use (F10–F19) (13.2%), mood disorders (F30–39) (9.8%), anxiety disorders (F40–F49) (9.6%), probable self-injuries (injuries and intoxication (S00–S99, T00–T99, and X00–X99) (5.9%), other psychiatric illness (7.4%), malformations of the nervous system and other symptoms involving cognitive functions and awareness (Q00–R99) (2.3%), somatic illness or symptoms (A00–E99 and G00–O99 including primary symptoms regarding pregnancy, abortion, digestive system, respiration, heart (9.9%), and health services for examination (2.5%)).

TABLE 1 Allocation of involuntary measures between 2000 and 2013

	All patients	Patients with a current registered ED	Patients without a current registered ED[2]
	Admissions (patients)	*Admissions (patients)*	*Admissions (patients)*
Total admissions	16,592 (4727)	8,221 (3388)	8,371 (2349)
Total admissions with involuntary measures	4,205 (858)	1,653 (592)	2,552 (459)
	Episodes (patients)	*Episodes (patients)*	*Episodes (patients)*
	Median duration (5th–95th percentiles)	Median duration (5th–95th percentiles)	Median duration (5th–95th percentiles)
Involuntary admissions	1851 (350)	599 (205)	1,252 (230)
Duration in days	3 (1–97)	5 (1–127)	3 (1–62)
Detentions	2,124 (547)	949 (358)	1,175 (292)
Duration in days	10 (1–141)	10 (1–170)	8 (1–101)
Guard/observation	4,732 (237)	2,369 (127)	2,363 (153)
Duration in day	0 (0–0)	0 (0–0)	0 (0–0)
Locked doors	245 (99)	127 (62)	118 (49)
Duration in days	2 (0–56)	2 (0–56)	2.5 (0–56)
Physical restraint	5,551 (427)	2,870 (286)	2,681 (213)
Duration in hours	0.1 (0–0.8)	0.1 (0–0.8)	0.1 (0–0.9)
Mechanical restraint	12,829 (299)	4,847 (171)	7,982 (204)
Duration in hours	5.7 (0.5–47.4)	3.9 (0.3–27.2)	7.8 (0.7–61)
Involuntary sedative medication	1,209 (235)	482 (131)	727 (131)
Duration in days	0 (0–41)	0 (0–63)	0 (0–28)
Involuntary medication	8,405 (119)	5,399 (67)	3,006 (61)
Duration in days	125 (12–461)	134 (12–267)	125 (10–479)
Involuntary tube feeding	16,733 (238)	15,584 (212)	1,149 (43)
Duration in days	164 (16–617)	170 (17–617)	49 (5–154)

ED = eating disorder (ICD10 F50).
Table shows number of admissions and episodes of involuntary interventions in the period 2000–2013 for patients with a lifetime diagnosis of anorexia nervosa, listed separately for the total number of admissions, the admissions with an eating disorder registered in relation to the index admission, and admissions without a current eating disorder registered.
Definitions: For each specific measure, total number of episodes, and total number of patients are listed along with the median duration (including the 5th–95th percentiles) of each measure.

- Detention is initiated in cases of voluntary admission when a patient wants to leave but has to stay for reasons that are identical to the reasons for involuntary admission.
- Guard/observations are initiated when a patient needs to be constantly observed to prevent harm to self (including severe purging behavior).
- Locked doors are initiated when a patient in an open ward is detained and is likely to elope if doors are not locked.
- Physical restraint is when personnel physically restrain a patient.
- Mechanical restraint is when a patient is secured with straps or belt.
- Involuntary sedative medication is used to calm a patient – often in an acute situation.
- Involuntary medication is initiated when a patient resists planned treatment and requires treatment with psychotropic medication. All types of administrations that applied to administer psychotropic medication against patients' will are included. An episode refers to a permission to medicate and not the number of times medication has been administered.
- Involuntary tube feeding is registered when the department is permitted to use a nasogastric (NG) tube to feed a patient who refuses to eat. Once permitted, NG tube feeding can continue until the chief physician orders discontinuation or until hospital discharge unless the patient lodges a complaint and the decision is in favor of the patient. An episode refers to a permission to tube feed and not the number of meals or episodes of tube insertions.

3.1 | Frequency of involuntary measures

A total of 4,205 (25.3%) admissions had involuntary measures registered (see Table 1). Of these, 1,653 had a current eating disorder diagnosis registered, with current eating disorder status absent or unknown in 60.7%. Median age of patients receiving involuntary measures was 24.8 years (IQR 18.0–29.2) for admission associated with an eating disorder and 28.5 years (IQR 21.0–32.8) for admission not associated with an eating disorder. Main diagnoses in relation to the latter were schizophrenia (44.2%), personality disorders (25.4%), probable self-injury and intoxication (7.8%), mental and behavioral disorders due to alcohol or drug use (4.9%), mood disorders (4.6%), anxiety disorders (3.5%), other psychiatric illness (5.9%), somatic illness or symptoms (2.2%), and health services for examination (1.5%).

A total of 858 of 4,727 patients (18.2%) had at least one involuntary measure with 2% of patients accounting for more than 100 episodes each (see Table 2).

As expected, involuntary tube feeding was the most frequently used measure in the sample with 16,733 episodes distributed across 238 patients, that is, an average of 70 episodes per patient with a median duration of 164 days covering an unknown numbers of meals (see Table 1). Following tube feeding, the next most common measures were involuntary medication and mechanical restraint with locked doors being the least common measure. A total of 44.7% of the detentions were associated with a current eating disorder

TABLE 2 Distribution of frequency of involuntary measure episodes

Number of episodes	Number of patients (*N* = 4,727)	Median follow-up time[a] since diagnosed with anorexia nervosa	Median time between anorexia nervosa diagnosis and first episode of involuntary treatment
0	3,869	7.76	
1	143	9.52	1.07
2	148	9.74	1.32
3–4	114	8.60	0.91
5–9	119	7.99	1.26
10–19	97	10.54	1.06
20–99	136	10.79	0.86
100–499	77	8.55	0.82
500+	24	10.69	1.62

Table shows the number of patients who experience varying frequencies of involuntary interventions.
[a] Median time since diagnosed with anorexia nervosa is assessed by the end of 2013, death, or immigration (whichever came first). Time listed in years.

diagnosis as were 50.1% of constant observations, 50.1% of episodes with locked doors, 51.7% of physical restraint, 37.8% of mechanical restraint, 39.9% sedative medication, and 64.2% other medication. In 6.9% of episodes of involuntary tube feeding, no eating disorder diagnosis was registered in relation to the admission. Primary diagnoses in these cases were schizophrenia, constipation, acute intoxication, or recurrent depressive disorder. Duration of involuntary treatment varied as displayed in Table 1. No notable differences were found between patients with and without a current eating disorder.

The number of admissions including involuntary measures across the total observation period shows an overall trend of progressively more episodes (see Table 3). However, the number of total admissions also increased, eliminating the effect of time. Furthermore, the number of first-time involuntary measures does not show similar increase.

Patterns of involuntary treatment episodes across age groups reveal significant differences, that is, in contrast to older patients, almost all involuntary measures among younger patients occur during admissions with a current registered eating disorder diagnosis (see Table 4). Furthermore, involuntary tube feeding peaked in patients between 15 and 18 years along with physical restraint and involuntary medication.

TABLE 3 Number of persons with admissions including involuntary measures by calendar year

	Number of individuals diagnosed with anorexia nervosa by year		Admissions with involuntary measures with a current registered ED		Admissions with involuntary measures without a current registered ED		All admissions with involuntary measures		Number of individuals with first involuntary measure and with a current ED registered[a]	Number of individuals with first involuntary measure and without a current ED registered[a]
Calendar year	N	Index	N	Index	N	Index	N	Index	N	N
2000	3,434	100.00	74	100.00	112	100.00	186	100.00	63	44
2001	3,778	110.02	92	124.32	136	121.43	228	122.58	32	24
2002	4,120	119.98	65	87.84	116	103.57	181	97.31	15	19
2003	4,526	131.80	92	124.32	166	148.21	258	138.71	22	31
2004	4,896	142.57	88	118.92	139	124.11	227	122.04	21	37
2005	5,268	153.41	98	132.43	191	170.54	289	155.38	25	35
2006	5,679	165.38	67	90.54	226	201.79	293	157.53	26	26
2007	6,113	178.01	125	168.92	176	157.14	301	161.83	23	45
2008	6,595	192.05	140	189.19	195	174.11	335	180.11	26	28
2009	7,127	207.54	161	217.57	154	137.50	315	169.35	23	39
2010	7,694	224.05	140	189.19	171	152.68	311	167.20	22	36
2011	8,236	239.84	157	212.16	204	182.14	361	194.09	24	40
2012	8,864	258.12	181	244.59	288	257.14	469	252.15	24	40
2013	9,505	276.79	173	233.78	278	248.21	451	242.47	26	42

ED = eating disorder (ICD10 F50).
Table reflects individuals diagnosed with anorexia nervosa 1969–2013 and therefore at risk of admission. The number of admissions with involuntary measure for these individuals are listed. These admissions can include several admissions per individual if this person has had several admissions including involuntary measures, within a year and/or across several years. Admissions with involuntary measures are distributed according to the presence or absence of a current registered eating disorder.
Columns labeled Index present the percentage-wise frequency of cases each year in relation to year 2000 (referent).
[a] Number of individuals with admissions including first time involuntary measure is listed.

TABLE 4 Allocation of involuntary measures across age groups

	Age 10–14 *n* = 901	Age 15–17 *n* = 1,052	Age 18–24 *n* = 1,597	25–40 *n* = 1,426	Age 40+ *n* = 701	p
	Episodes (% with ED)	Episodes (% with ED)	Episodes (% with ED)	Episodes (% with ED)	Episodes (% with ED)	
Total admissions	1,581 (80.3)	2071 (70.5)	4,565 (52.4)	5,309 (40.8)	2,980 (29.2)	<.001
Involuntary admissions	44 (86.4)	199 (53.8)	634 (35.5)	777 (23.0)	197 (25.4)	<.001
Detentions	83 (90.4)	381 (71.7)	628 (45.1)	861 (31.2)	171 (28.7)	<.001
Guard/observation	969 (99.6)	823 (64.9)	1,030 (19.5)	1,763 (37.0)	147 (11.6)	<.001
Locked doors	10 (100.0)	47 (78.7)	95 (43.2)	85 (43.5)	8 (25.0)	<.001
Physical restraint	1,173 (95.8)	1,569 (58.7)	1,270 (40.2)	1,308 (22.1)	231 (10.8)	<.001
Mechanical restraint	934 (96.6)	3,271 (58.3)	3,530 (30.3)	4,492 (21.0)	602 (4.0)	<.001
Involuntary sedative medication	103 (95.1)	221 (68.3)	457 (32.2)	392 (20.9)	36 (11.1)	<.001
Involuntary medication	2,380 (99.9)	3,078 (75.4)	1,425 (33.1)	1,108 (20.0)	414 (1.7)	<.001
Involuntary tube feeding	2,399 (95.2)	10,016 (97.9)	1865 (91.7)	1929 (70.9)	524 (80.0)	<.001

ED = eating disorder (ICD F50).
Table displays total number of admissions and episodes of involuntary measures for the age groups listed. Percentage of episodes with involuntary measures given in admissions with a current eating disorder diagnosis registered is listed in parentheses for each age group. Results of Chi-square test comparisons of the proportion of patients with an eating disorder at admission with involuntary measure across age groups is reported.
Patients can be counted in more than one age group if they experienced several involuntary interventions at different ages.
Definitions of measures:

- Detention is initiated in cases of voluntary admission when a patient wants to leave but has to stay for reasons that are identical to the reasons for involuntary admission.
- Guard/observations are initiated when a patient needs to be constantly observed to prevent harm to self (including severe purging behavior).
- Locked doors are initiated when a patient in an open ward is detained and is likely to elope if doors are not locked.
- Physical restraint is when personnel physically restrain a patient.
- Mechanical restraint is when a patient is secured with straps or belt.
- Involuntary sedative medication is used to calm a patient—often in an acute situation.
- Involuntary medication is initiated when a patient resists planned treatment and requires treatment with psychotropic medication. All types of administrations that are applied to administer psychotropic medication against patients' will are included. An episode refers to a permission to medicate and not the number of times medication has been administered.
- Involuntary tube feeding is registered when the department is permitted to use a nasogastric (NG) tube to feed a patient who refuses to eat. Once permitted, NG tube feeding can continue until the chief physician orders discontinuation or until hospital discharge unless the patient lodges a complaint and the decision is in favor of the patient. An episode refers to a permission to tube feed and not the number of meals or episodes of tube insertions.

3.2 | Predictors of involuntary treatment

A total of 4,610 persons (covering 21,760 person-years) at risk of involuntary treatment were included in the predictor analysis, of whom 348 (7.5%) experienced involuntary measures, irrespective of the presence or absence of a registered eating disorder diagnosis at the index admission. Factors that predicted first registered involuntary measure included previous inpatient treatment, older age at first diagnosis, and all types of psychiatric comorbidity except behavioral and emotional disorders with onset in childhood and adolescence and intellectual disability (see Table 5). Calendar year, ethnicity, gender, mother's age at birth, parental psychopathology, and parents' education did not predict involuntary treatment.

Limiting the analysis to first recorded involuntary measure that occurred in admissions in which a current eating disorder diagnosis was registered changed the results primarily by substantially decreasing the effect of earlier admission (from HR 27.79 to HR 1.54) and older age (from HR 7.76 to HR 3.58) (see Table 6). Additionally, organic psychiatric illness (HR 2.66, $p = .04$) and behavioral and emotional disorders with onset in childhood and adolescence (HR 1.45, $p = .02$) became significant predictors of first involuntary treatment.

4 | DISCUSSION

This is the first study to present the frequency and nature of a comprehensive range of involuntary measures used in a national sample of all patients ever diagnosed with anorexia nervosa. Earlier studies typically reported on small samples and with a single exception, focused on generic involuntary treatment (Clausen & Jones, 2014). In our comprehensive national sample, a total of 18% of patients who were treated in an inpatient setting had at least one involuntary measure compared to earlier studies reporting between 13 and 44% of patients with anorexia nervosa (Clausen & Jones, 2014).

As expected, tube feeding was the most frequently invoked involuntary measure with a median duration of 164 days, revealing a protracted course of an involuntary intervention. Data are not available on how many meals were delivered via tube feeding; however, it is common clinical practice to keep the tube in place or just sustain the involuntary status and the right to tube feed involuntary (sometimes without actual tube feeding) for days or weeks after initial renourishment as a supplement if the patient is unable to consume adequate energy via food. In some wards or countries, patients receive tube feeding until normal weight is achieved (Laakmann et al., 2006). This is rare in Denmark but happens in cases with documentation of earlier severe weight loss post-discharge anticipating a recurrence of the renourishment/weight loss relapse pattern. Our study reveals that a subset of patients receives a very high number (i.e., hundreds) of involuntary measures—especially tube feeding. A more detailed examination of the clinical characteristics of this subgroup is essential if our goal is to reduce the total number of involuntary measures prescribed nationwide.

TABLE 5 Prediction of first involuntary measure episode in an admission with or without a current registered eating disorder

	Event (*N* = 348)	Haz. Ratio	Std. err.	95% Conf. Interval	z	*p*
Women	323	1.00	(base)			
Men	25	1.01	0.22	0.66–1.54	0.03	.98
Age at diagnosis10-12	55	0.02	0.01	0.01–0.05	−10.01	<.001
Age at diagnosis 13–14	134	0.13	0.04	0.07–0.24	−6.62	<.001
Age at diagnosis 15–17	114	0.54	0.14	0.32–0.91	−2.30	.02
Age at diagnosis 18–20	29	1.00	(base)			
Age at diagnosis 21+	16	7.76	3.26	3.41–17.67	4.88	<.001
F00_F09 organic mental disorders	6	1.96	0.83	0.85–4.49	1.58	.11
F10_F19 mental and behavioral disorders due to psychoactive substance use	18	1.34	0.34	0.81–2.20	1.15	.25
F20_F29 schizophrenia spectrum disorders	48	4.28	0.72	3.07–5.95	8.61	<.001
F30_F39 mood disorders	113	1.46	0.18	1.15–1.86	3.07	.002
F40_F48 anxiety disorders	119	1.40	0.17	1.11–1.78	2.81	.005
F60 personality disorders	60	2.70	0.45	1.95–3.74	5.96	<.001
F70_F79 mental retardation	11	0.65	0.21	0.35–1.21	−1.35	.18
F84 autism spectrum disorders	38	2.39	0.44	1.66–3.43	4.68	<.001
F90_F98 behavioral and emotional disorders with onset in childhood	66	1.00	0.15	0.74–1.34	−0.03	.98
Earlier admission	321	27.79	5.65	18.65–41.41	16.34	<.001
Parental psychopathology	83	0.92	0.12	0.71–1.19	−0.65	.52
High maternal education[a]	121	1.17	0.15	0.92–1.49	1.27	.20
High paternal education[a]	106	1.01	0.13	0.79–1.30	0.08	.93
Calendar year 2000–2004	64		(base)			
Calendar year 2005–2009	125	1.10	0.62	0.81–1.50	0.62	.54
Calendar year 2010–2013	159	1.01	0.03	0.73–1.38	0.03	.98

Table 5 displays the risk (Hazard Ratio) for a first episode of involuntary measure with or without an eating disorder diagnosis at the index admission.
[a] High education is defined as more than high school.

Involuntary restraints and medication are typically used to calm patients who are responding aggressively towards themselves or others. The frequency of involuntary restraints and medication used with eating disorders patients is similar or somewhat lower than that in patients with schizophrenia (Øhlenschlæger & Nordentoft, 2008). The relative high frequency of other involuntary measures than tube feeding in eating disorders was somewhat unexpected as it is not often reported in the literature.

The time trend showing increasing numbers of patients diagnosed, admitted, and treated involuntary is in line with the trend seen in the Danish psychiatric health care system in general with increasing numbers of individuals being diagnosed and treated for psychiatric illnesses (Danish Ministry of Health, 2015; Jeppesen, Christensen, & Vestergaard, 2016). Our study cannot discern the extent to which the trend toward increasing involuntary measures reflects increasing severity of eating disorders or changes in our health care system and approach to treatment. However, we did not observe an increase in first time involuntary measures, so the observed trend most likely reflects a subgroup of patients who accumulate several admissions and involuntary measures across several years of treatment.

Consistent with previous studies (Clausen & Jones, 2014), comorbidity was associated with increased risk of involuntary measures. As in general psychiatric treatment populations (Furre et al., 2014; Ulla, Maritta, & Riittakerttu, 2012), we found the presence of schizophrenia spectrum disorders increased the risk of involuntary treatment as did most psychiatric comorbidity, especially personality disorders and autism spectrum disorder.

In contrast to results by Ayton, Keen, and Lask (2009), we found that older age at first diagnosis was associated with greater risk of involuntary treatment. These results could reflect that patients diagnosed early and treated when young, have a shorter illness duration and better prognosis (Steinhausen, 2002). Patients with older age at first diagnosis could be individuals with long-standing undiagnosed illness or patients with other primary psychopathology with later onset anorexia nervosa. Indeed, late onset has been found to be associated with less favorable treatment outcome (Steinhausen, 2002).

The observed pattern of results highlights considerable heterogeneity amongst patients receiving involuntary measures—especially the subgroup of patients receiving greater than 100 measures stands out. Avoiding involuntary treatment is preferred by both clinicians and patients as it may violate fundamental rights of self-determination and can be experienced as transgressive. However, the necessary role of involuntary treatment in preserving health and life in patients with anorexia nervosa is acknowledged by clinicians, patients, and relatives in retrospect (Guarda et al., 2007; Tan, Hope, Stewart, & Fitzpatrick, 2003; Tan, Stewart, Fitzpatrick, & Hope, 2010). To minimize the use of these methods, it is important to explore further the situations under which patients require involuntary measures.

The uniqueness and strength of our study is the population-based nationwide data including all patients diagnosed with anorexia

TABLE 6 Prediction of first involuntary measure episode in an admission with a current registered eating disorder

	Event (*N* = 333)	Haz. Ratio	Std. err.	95% Conf. Interval	z	*p*
Women	312	1	(base)			
Men	21	0.70	0.16	0.45–1.10	−1.53	.13
Age at diagnosis 10–12	52	0.04	0.02	0.02–0.09	−8.42	<.001
Age at diagnosis 13–14	130	0.20	0.06	011–0.36	−5.33	<.001
Age at diagnosis 15–17	107	0.56	0.15	0.33–0.94	−2.21	.03
Age at diagnosis 18–20	29	1	(base)			
Age at diagnosis 21+	15	3.58	1.49	1.58–8.11	3.06	.002
F00_F09 organic mental disorders	5	2.66	1.26	1.05–6.74	2.06	.04
F10_F19 mental and behavioral disorders due to psychoactive substance use	16	1.61	0.44	0.94–2.77	1.74	.08
F20_F29 schizophrenia spectrum disorders	41	4.36	0.79	3.05–6.23	8.08	<.001
F30_F39 mood disorders	108	2.02	0.26	1.57–2.59	5.47	<.001
F40_F48 anxiety disorders	116	1.74	0.22	1.37–2.23	4.47	<.001
F60 personality disorders	57	3.33	0.59	2.35–4.71	6.75	<.001
F70_F79 mental retardation	11	1.11	0.36	0.60–2.05	0.33	.74
F84 autism spectrum disorders	36	2.64	0.50	1.83–3.82	5.16	<.001
F90_F98 behavioral and emotional disorders with onset in childhood	63	1.45	0.22	1.07–1.97	2.41	.02
Earlier admission	50	1.54	0.28	1.07–2.21	2.34	.02
Parental psychopathology	80	0·92	0.12	0.71–1.20	−0.60	.55
High maternal education[a]	114	1.17	0.15	0.91–1.51	1.24	.22
High paternal education[a]	100	1.04	0.14	0.80–1.36	0.30	.76
Calendar year 2000–2004	60	1	(base)			
Calendar year 2005–2009	121	0..92	0.15	0.67–1.27	−0.50	.61
Calendar year 2010–2013	152	0.74	0.12	0.53–1.02	−1.85	.07

The table displays the risk (Hazard Ratio) for a first episode with involuntary treatment in an admission with the presents of a current eating disorder diagnosis at the index admission.
[a] High education is defined as more than high school.

nervosa and all their admissions and involuntary treatment episodes across a 14-year period. As is typical of register studies, the validity of diagnoses rests on the registration and assessment practices at each hospital. Notably, half of the admissions detected did not include a current eating disorder diagnosis. This could reflect errors of omission at hospital registration or differences in treatment practices of youth and adults, or it could accurately reflect the presenting complaint, with individuals with past eating disorder, presenting at later dates for admission with other current severe psychiatric presentations. Regarding differences in treatment practice there might be more focus on nutritional deficiency in youth still in growth compared to adults resulting in eating disorder diagnoses eclipsing other psychiatric diagnoses in youth and opposite less focus on eating disorders in adults resulting in other psychiatric diagnoses eclipsing possible eating disorders in adults. Regarding the presentation of other psychiatric presentations later in life this is likely given that we know that individuals with anorexia nervosa do continue to exhibit depression and anxiety symptoms even after remission of the primary eating disorder (Holtkamp, Müller, Heussen, Remschmidt, & Herpertz-Dahlmann, 2005) and that non-eating disorder diagnoses registered at admission with involuntary treatment in the present study included schizophrenia, personality disorders, mood, and anxiety disorders. These differences in diagnoses across age groups may also explain the more frequent use of tube feeding among the younger patients compared to the older patients. Also, the nutritional focus in youth who are still growing might reflect concerns from parents and professionals and a more directive approach towards the re-nutrition of children and adolescents compared to adults who have had anorexia nervosa for years.

Limitations to our study should also be considered. First, the exclusion of individuals born before 1985 in the predictor analysis yields a younger sample for these analyses; however, this is unlikely to affect the results as the risk of involuntary measures is highest in the first admission and decreases with subsequent admissions (Thomsen et al., 2017). Second, involuntary treatment in children and adolescents under 18 years of age might be underreported prior to 2012, as it was only after the summer of 2011 that treatment against the child's will, but with the parents' permission, was to be reported in the register. Before this time the guidelines were unclear and were executed differently across hospitals. Data on involuntary treatment after 2013 were not included due to specific permissions required, meaning that recent changes in the use of involuntary measures may not be captured in our results. The seven percent of episodes with involuntary tube feeding in patients with no current eating disorder diagnosis might reflect some registration errors. However, we are not able to explore this and in general the Danish registers are typically considered to be valid (Mors et al., 2011; Munk-Jorgensen & Ostergaard, 2011; Pedersen et al., 2014). Last, the use of involuntary measures depends on local legislation and health care system and

specificities of the Danish system might limit the external validity of our results.

The nature and frequency of involuntary measures used in patients diagnosed with anorexia nervosa reflects the complex course and seriousness of the disorder. To reduce the frequency of involuntary measures, we must explore alternative ways to effectively renourish individuals in the mid-teenage years who are the primary recipients of involuntary tube feeding, and how best to manage individuals with later onset eating disorders and patients with complex comorbid profiles. We may need to institute different approaches to reduce the frequency of involuntary measures depending on patient profile and ethical considerations. Importantly, deeper investigation is required to fully understand those individuals who receive hundreds of involuntary measures during the course of their illness and to determine whether safe and effective treatment is possible with fewer involuntary measures. Involuntary treatment is a double-edged sword, and to further explore the ethics and efficacy of involuntary measures, future studies should also include longitudinal outcome investigations focusing on illness trajectories and recovery as well as qualitative studies on patients' and families' perspectives on involuntary treatment.

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AUTHOR CONTRIBUTION

LC was involved in the initial idea of the study, the study design, interpretation of results and was responsible for writing the paper. JTL and LP were involved in the study design, data analysis, interpretations of results and paper revision. CB was involved in the study design, interpretation of results, and paper revision. All authors approved the final version of the paper.

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